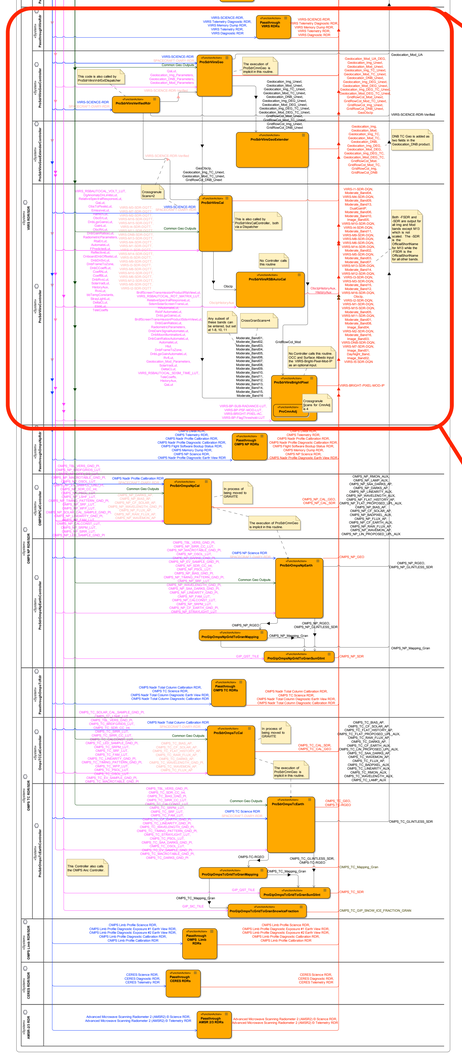
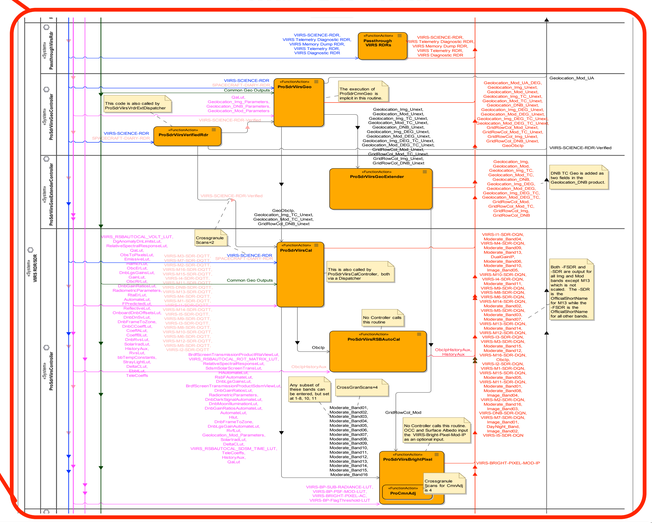
Accurate Data Flow Management Tool Facilitates Operational Stability and Risk Management in a Complex and Dynamic Science Processing Environment

The Joint Polar Satellite System (JPSS) Interface Data Processing Segment (IDPS) produces dozens of meteorological data products useful to weather and climatology scientists. The processing chain to result in these products is complex, with interdependency among the products themselves as well as with databases external to the JPSS system. Data flow management through this system presents a challenge with multiple sources and users of various data products. The data flow has been modeled using MagicDraw, an Enterprise Architecture application using DoDAF formalism. The MagicDraw modeling tool allows different views or perspectives of the same system while maintaining a unified construct. The model is very accurate since it is built from the Algorithm Development Library (ADL) code itself, rather than from requirements documents or software descriptions. The data flows are generated from the configuration files, and the process and data element names are the operational names. Collection Short Names are included within the data elements. The JPSS Program uses the model to manage responsibilities for products, to create and manage requirements specifications, and to scope downstream impacts to changes in a particular product. With the upcoming transition to an Enterprise science processing paradigm, this model could be extended to model the full data processing flow in IDPS, NPP Data Exploitation (NDE), GOES-R, and other missions. Managing the data flow between and within these systems will be challenging without a similar tool.

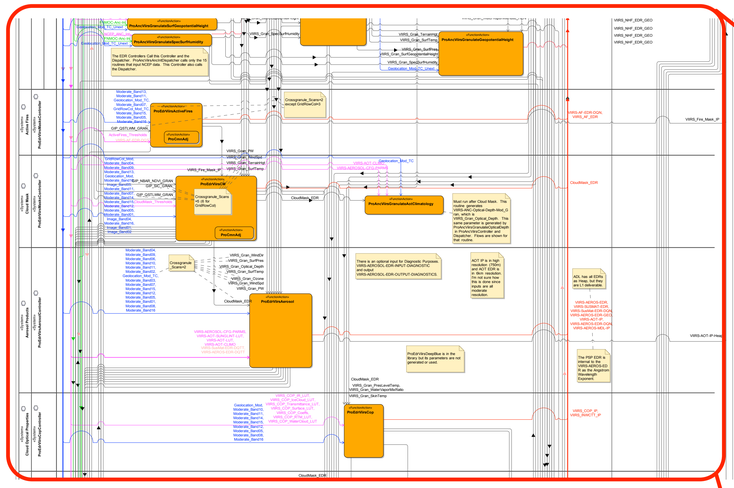
Block 2.0 SDR Data Flow



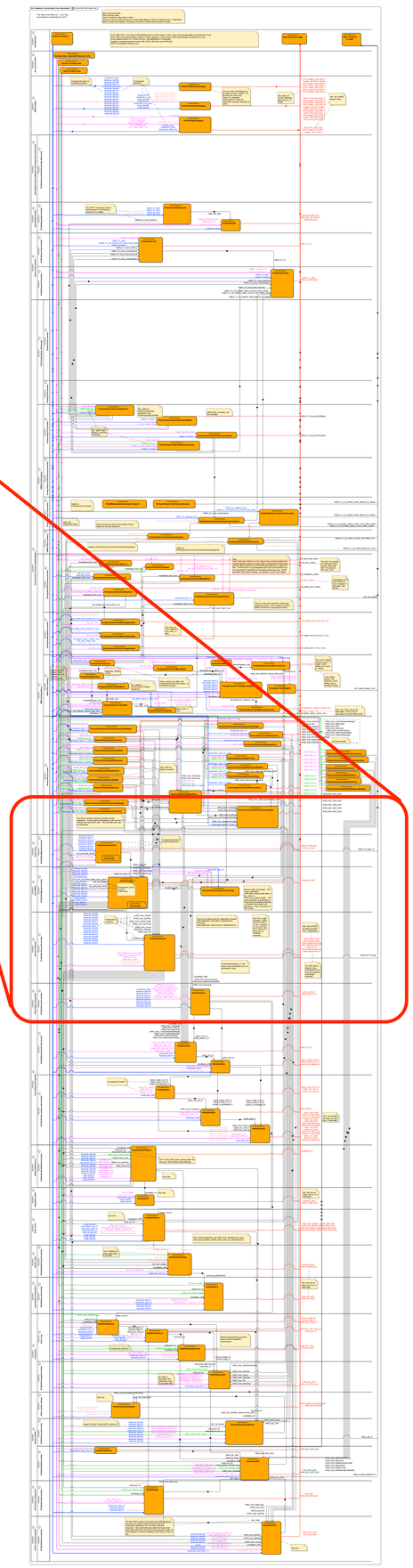
VIIRS SDR Chain



Masks and Aerosols Chain

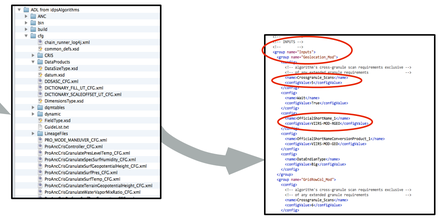


Block 2.0 EDR Data Flow



The Process:

- The model is based on an ADL tarball, e.g. idpsAlgorithms_20140327_2202.tgz.
- The configuration files (_CFG) are located and collected.
- Each _CFG file is then analyzed for Controllers, Inputs, Outputs, Optional and Graceful Degradation designations, and Cross-granule requirements.
- The Controllers are set up as "swimlanes" in the Model, containing their called code modules.
- The data products are chained together with the science algorithms as Inputs and Outputs according to the _CFG files.
- The Collection Short Names are added as tags to the data products.



The Benefits:

- Accurate because it is built directly from the ADL code
- Current (Block 2.0)
- Critical for determining product interdependencies
- Comprehensive - flight science data, ancillary and auxiliary data, intermediate products, EDRs
- Tool allows different views of the same construct
  - o Data Flow diagrams as on this poster
  - o Data Flow tables in Excel-like format
  - o Individual Data Product Details
  - o "Used By" feature to see downstream dependencies
  - o Code modules called by each controller

Future Opportunities:

- Extend model to include NDE data processing
- Extend model to include GOES-R data processing
- Extend model to include other missions
- Include data product .xml structure
- Trace usage of fields within data products (e.g. Quality Flags)
- Extend model to include User end-delivery points

The Data Flow diagrams on the left (SDRs) and right (EDRs) model each science software process, or algorithm, in the IDPS system. The diagrams show inputs, outputs, and interdependencies between the science algorithms. For each algorithm, the inputs are shown coming from the top and left, and the outputs are shown from the bottom and right.

Color Key:

Blue	Input science data
Pink	Ancillary and auxiliary data (LUTs)
Red	Level 1 deliverables at the far right
Peach	Optional inputs
Green	Graceful degradation products

Jeffries Technology Solutions, Inc.
– JeTSI –
+1(703) 471-7588
www.jetsi.com

JPSS Ground Project Architecture Team

Laura Ellen Dafoe, Algorithm Architect
Jeffrey Hayden, System Architect